Hydraulic Fracturing
Water Tracker

RBDMS
Water Tracker
• New well water use
  – Mud systems for cooling, lubrication and pressure control
  – Completion practices use water as carrier fluid for pressure to fracture and move proppant.
• Old fields need water as driver to move oil through the reservoir
• Access to fresh water is controlled
  – Individual owners
  – State law through regulatory agencies

• Water use is defined as consumptive use
  – Not returned to a water resource system

• Streams may require makeup water
  – Augmentation plan
• Mobile storage tanks
• Reserve pit or impoundment on single well site
• Multi-well pit or impoundment on well site
• Centralized pit(s) or impoundment(s) servicing multiple locations
Fluids Returned to Surface

- Considered exploration and production waste
- Regulated by the state
- Strict compliance and handling requirements
- Limited use depending on water quality
- Beneficial use may be regulated by different agency
• Reserve Pit or Impoundment on Single Well Site
• Multi-Well Pit or Impoundment on Location
• Centralized Pit or Impoundment Servicing Multiple Locations
• Fluids Reuse
  – Drilling Fluids
    • Other drilling operations
    • Soil supplement
  – Flowback
    • Sand
    • Depends on the stimulation technology
  – Produced Water
    • Beneficial Reuse
    • New Hydraulic Fracture Treatment Operation
• Not all fluids can be recycled
• Proper effluent disposal from facility
• TDS exists throughout system and if totally eliminated creates negative impact on usability of output fluid – too clean
• Proper disposal of solid waste
• Recycled - Reuse
  – Industry reuse
  – Public Water supply
  – Makeup Water – Augmentation
Points of Measurement

• Transfer point is the inlet or outlet of storage or source, such as sales or regulatory control point.
• Critical volume measurement such as the hydraulic stimulation.
• Accuracy and methods of measurement are very disparate.
Example Oil & Gas Regulatory Requirement

<table>
<thead>
<tr>
<th>Form 5A</th>
<th>State of Colorado Oil and Gas Conservation Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev 6/12</td>
<td>1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303)894-2100 Fax:(303)894-2109</td>
</tr>
</tbody>
</table>

**COMPLETED INTERVAL REPORT**

<table>
<thead>
<tr>
<th>Formation:</th>
<th>Status:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Date of First Production for this formation:</th>
<th>This formation is commingled with another formation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubing Size:</td>
<td>Tubing Setting Depth:</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Tbg Setting Date:</td>
<td>Packer Depth:</td>
</tr>
</tbody>
</table>

**Formation Treatment**

<table>
<thead>
<tr>
<th>Perforations</th>
<th>Treatment Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top:</td>
<td>Bottom:</td>
</tr>
<tr>
<td>No. Holes:</td>
<td>Hole Size:</td>
</tr>
<tr>
<td>Open Hole:</td>
<td></td>
</tr>
</tbody>
</table>

Provide a brief summary of the formation treatment: 

<table>
<thead>
<tr>
<th>Treatment Dates: Start:</th>
<th>End:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Total fluid used in treatment (bbl):</th>
<th>Max pressure during treatment (psi):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total gas used in treatment (mcf):</td>
<td>Fluid density at initial fracture (lbs/gal):</td>
</tr>
<tr>
<td>Type of gas used in treatment:</td>
<td>Min frac gradient (psi/ft):</td>
</tr>
<tr>
<td>Total acid used in treatment (bbl):</td>
<td>Number of staged intervals:</td>
</tr>
<tr>
<td>Recycled water used in treatment (bbl):</td>
<td>Flowback volume recovered (bbl):</td>
</tr>
<tr>
<td>Fresh water used in treatment (bbl):</td>
<td>Disposition method for flowback:</td>
</tr>
<tr>
<td>Total proppant used (lbs):</td>
<td>Rule 805 green completion techniques were utilized:</td>
</tr>
<tr>
<td>Fracture stimulations must be reported on FracFocus.org</td>
<td>Reason why green completion not utilized:</td>
</tr>
</tbody>
</table>
Conclusions

- Measurement of water use is complicated
- Recycling makes a difference but is complicated
- It makes sense to reuse and recycle oil and gas waste water
- Jurisdictional issues abound
- Things are changing
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  – Dave Lowther
  – Dottie Virden